Using sensors and instruments on the bench to improve the way we blast

Lachlan Kennelly

Presented by John Jackson

Nov 2018

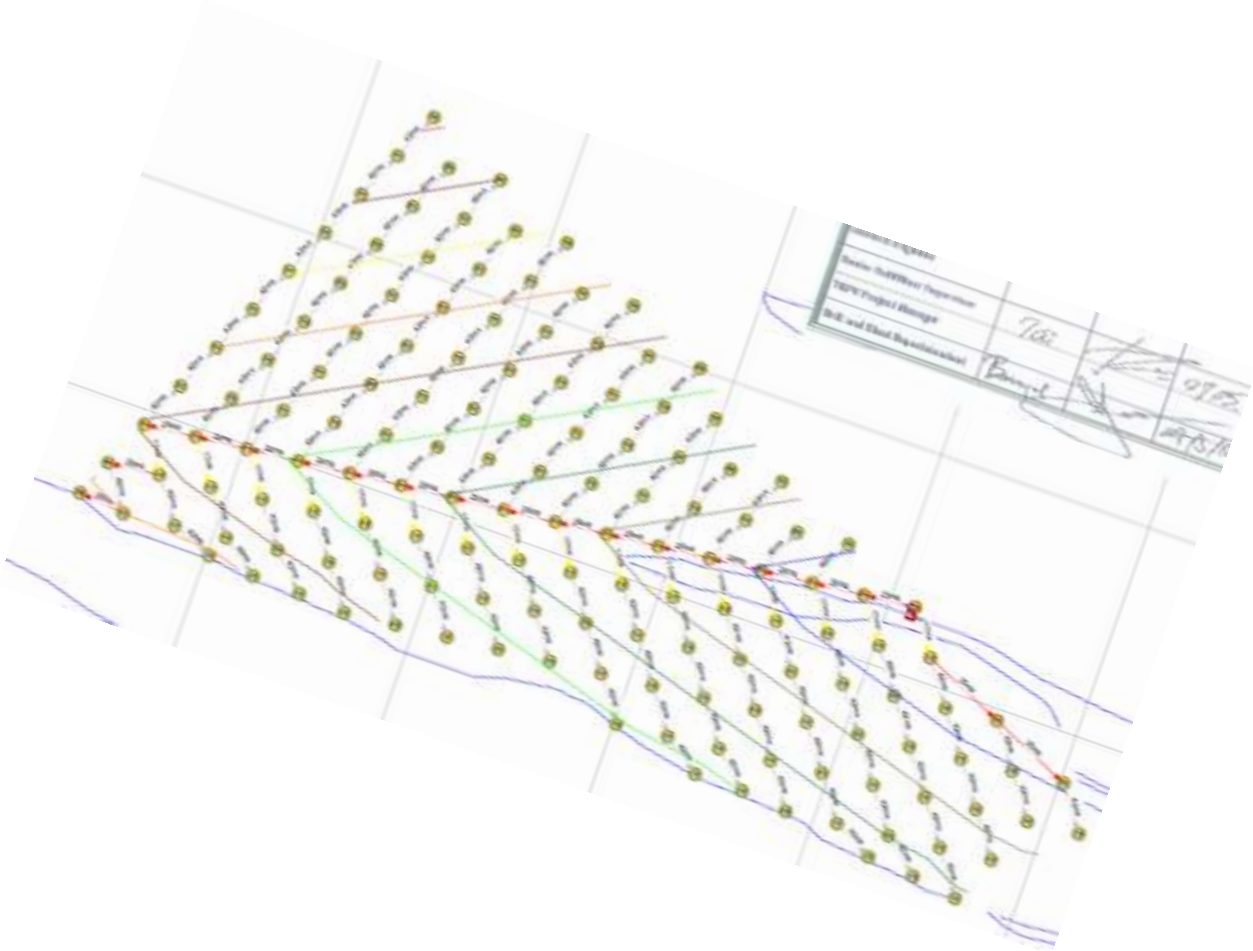
IMDEX™
REAL-TIME SUBSURFACE SOLUTIONS

Where we are now

IMDEX™
REAL-TIME SUBSURFACE SOLUTIONS

The common blast:

- Single powder factor per blast block
- Single Burden and Spacing
- Single blast hole diameter
- Reasonably consistent timing across shot



The balancing act

- Cost?
- Loss and dilution?
- Vibrations?
- Spillage?
- Cast?
- Fragmentation?
- Geotechnical?
- Fume?
- Dust?

The assumptions

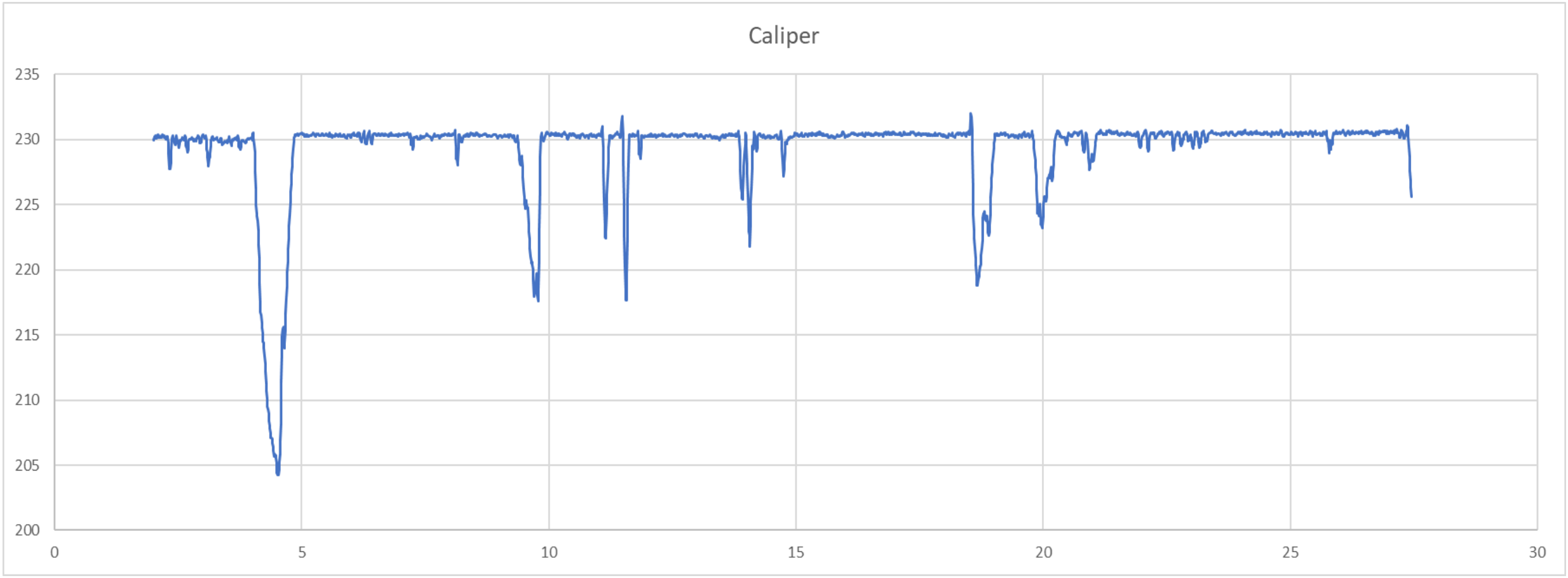
Although it is well understood that rock masses are heterogeneous, blast hole conditions are imperfect and the material moves, blasts *tend* to designed with the following assumptions:

1. The **diameter** is the same as the bit size
2. There is no **deviation** from collar dip and azimuth
3. **Structures** don't really exist
4. The material is **consistent**

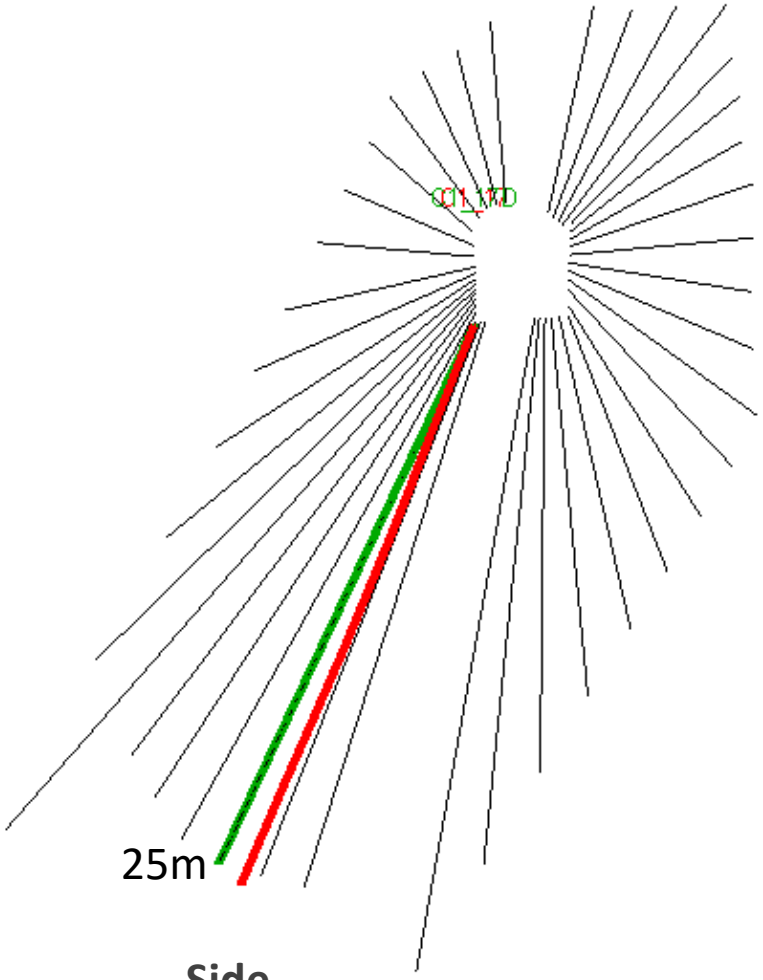
Same as the bit size?

290mm??

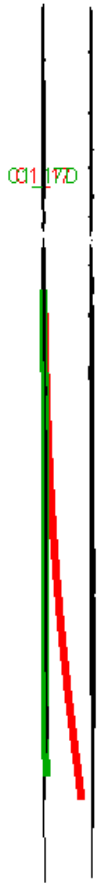
Same as the bit size?



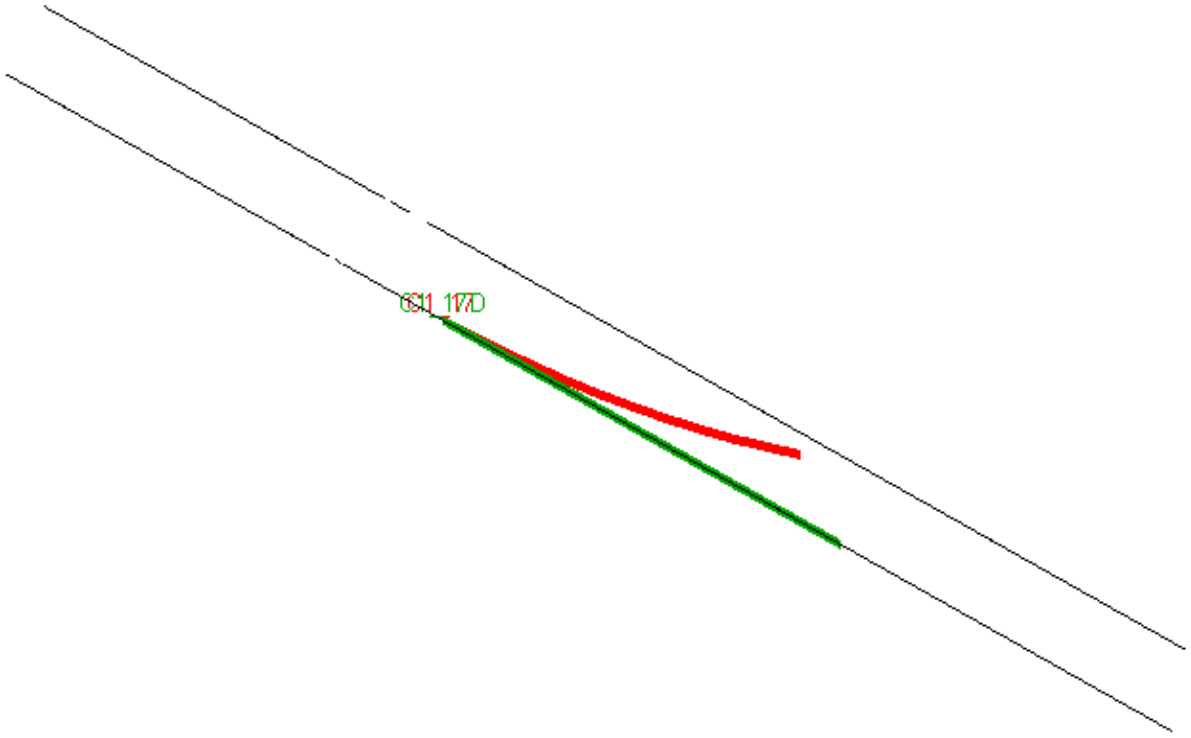
Deviation?



Side

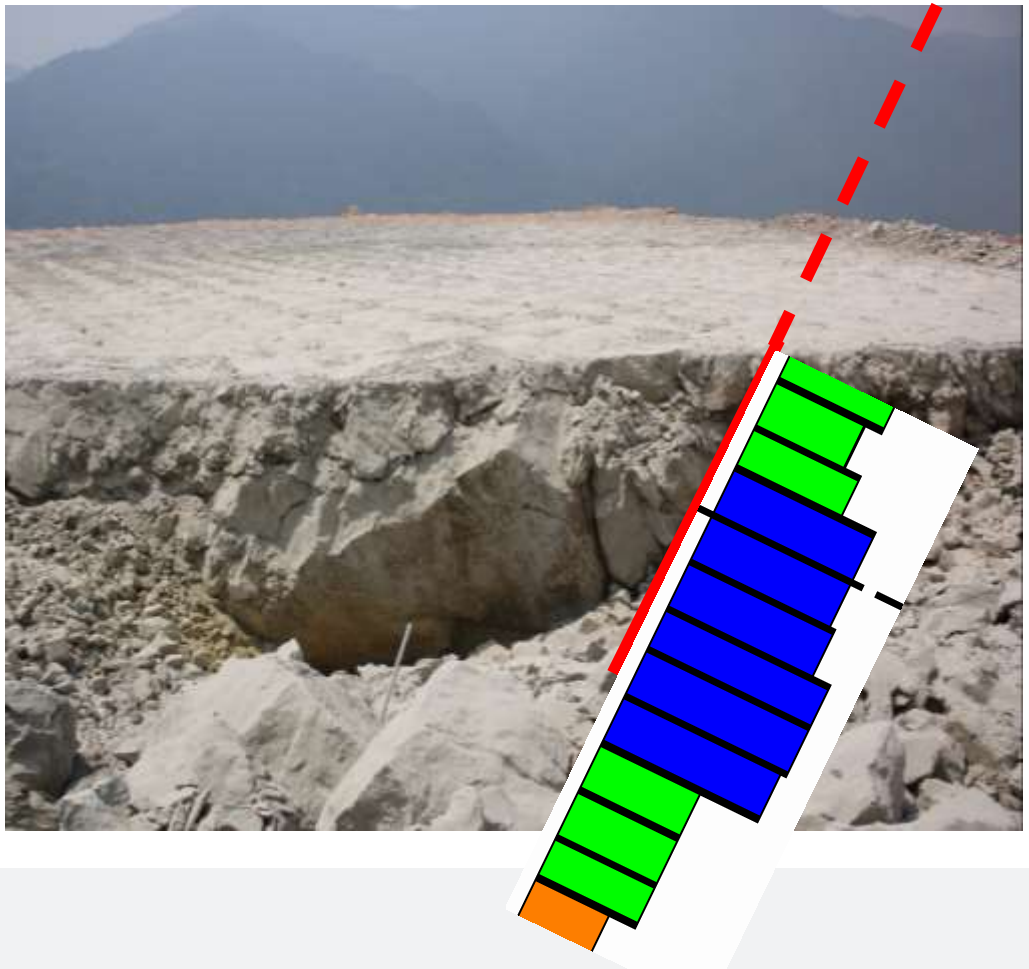


Front



Top

Structures?



Geology resembles cement?

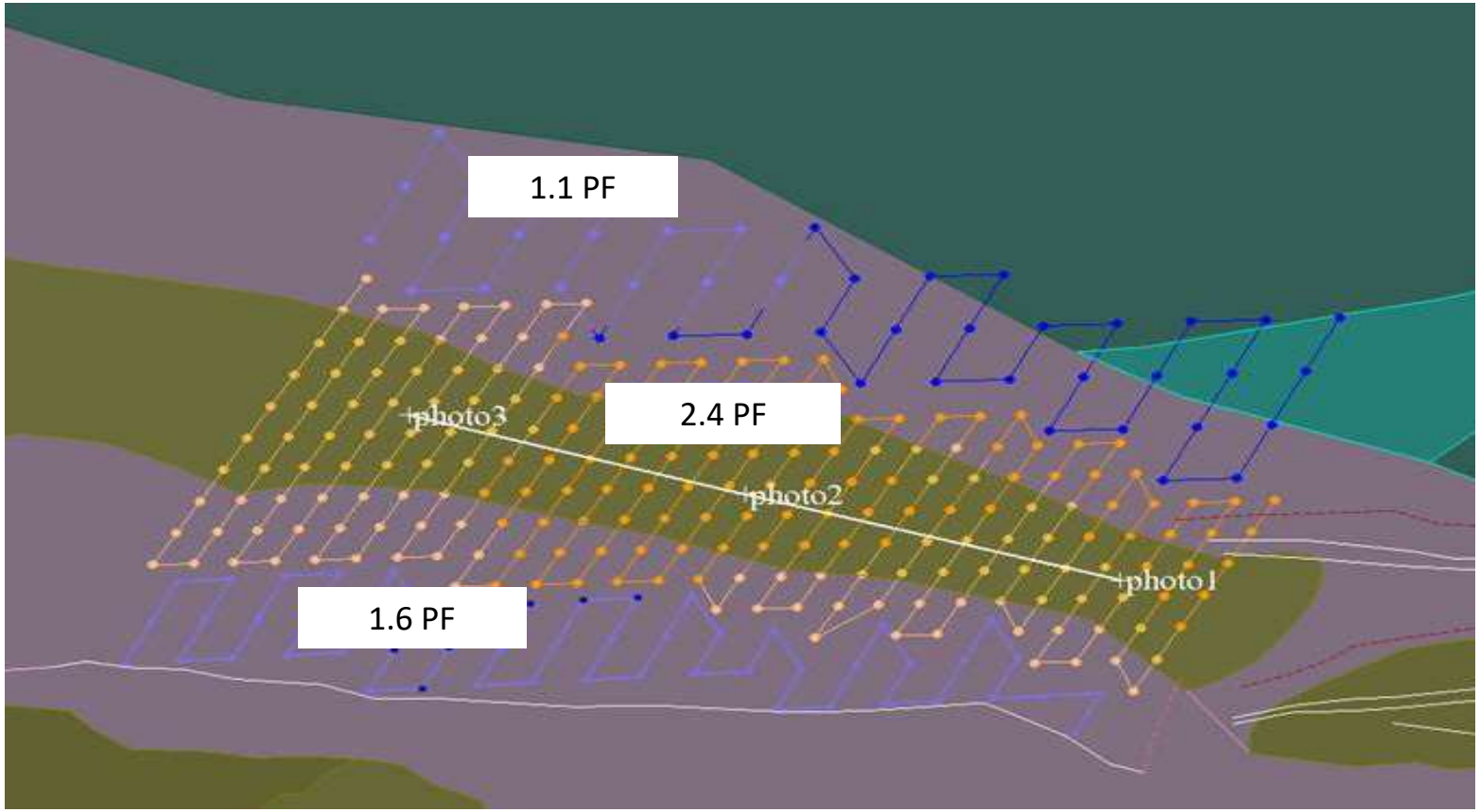
A small case study

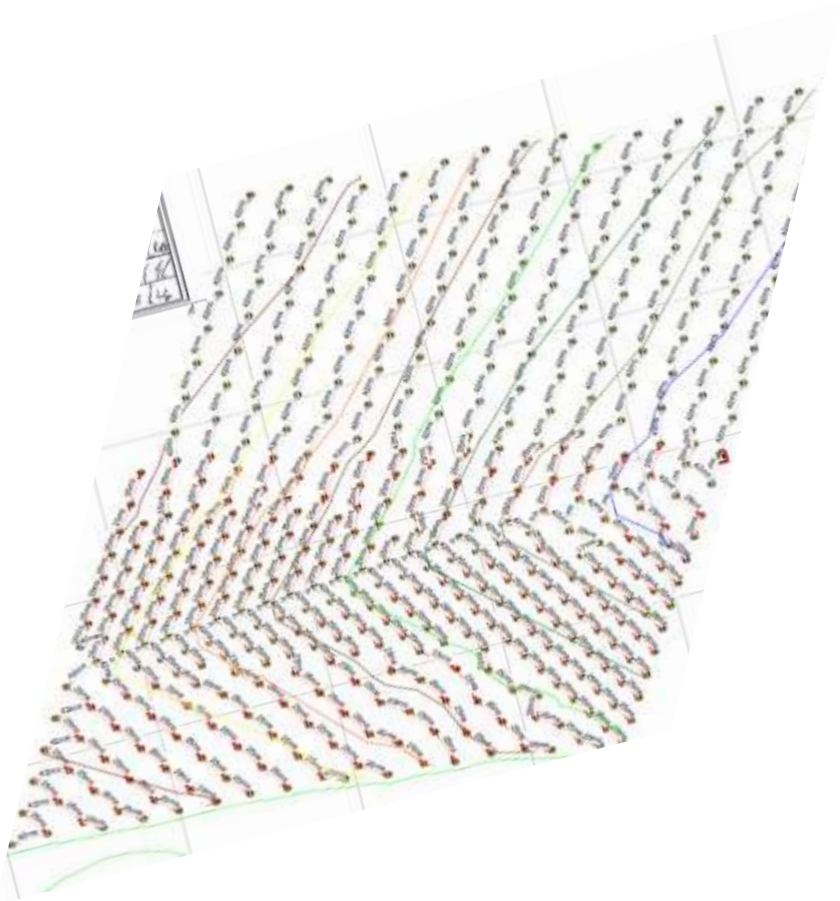
These two zones shared very few similarities…

Things we wished we knew:

- Structure
- Hardness (all of them)
- Grade (plant metal unit capacity)
- Hole physicals

Starting to match energy to rock hardness





Starting to match energy to rock hardness

IMDEX™
REAL-TIME SUBSURFACE SOLUTIONS

Starting to match energy to rock hardness

IMDEX™
REAL-TIME SUBSURFACE SOLUTIONS

Starting to match energy to rock hardness

Starting to match energy to rock hardness

Starting to match energy to rock hardness

IMDEX™
REAL-TIME SUBSURFACE SOLUTIONS

Starting to match energy to rock hardness

IMDEX™
REAL-TIME SUBSURFACE SOLUTIONS

Starting to match energy to rock hardness

Starting to match energy to rock hardness

Starting to match energy to rock hardness

IMDEX™
REAL-TIME SUBSURFACE SOLUTIONS

Starting to match energy to rock hardness

Starting to match energy to rock hardness

Starting to match energy to rock hardness

IMDEX™
REAL-TIME SUBSURFACE SOLUTIONS

Starting to match energy to rock hardness

Starting to match energy to rock hardness

IMDEX™
REAL-TIME SUBSURFACE SOLUTIONS

Starting to match energy to rock hardness

IMDEX™
REAL-TIME SUBSURFACE SOLUTIONS

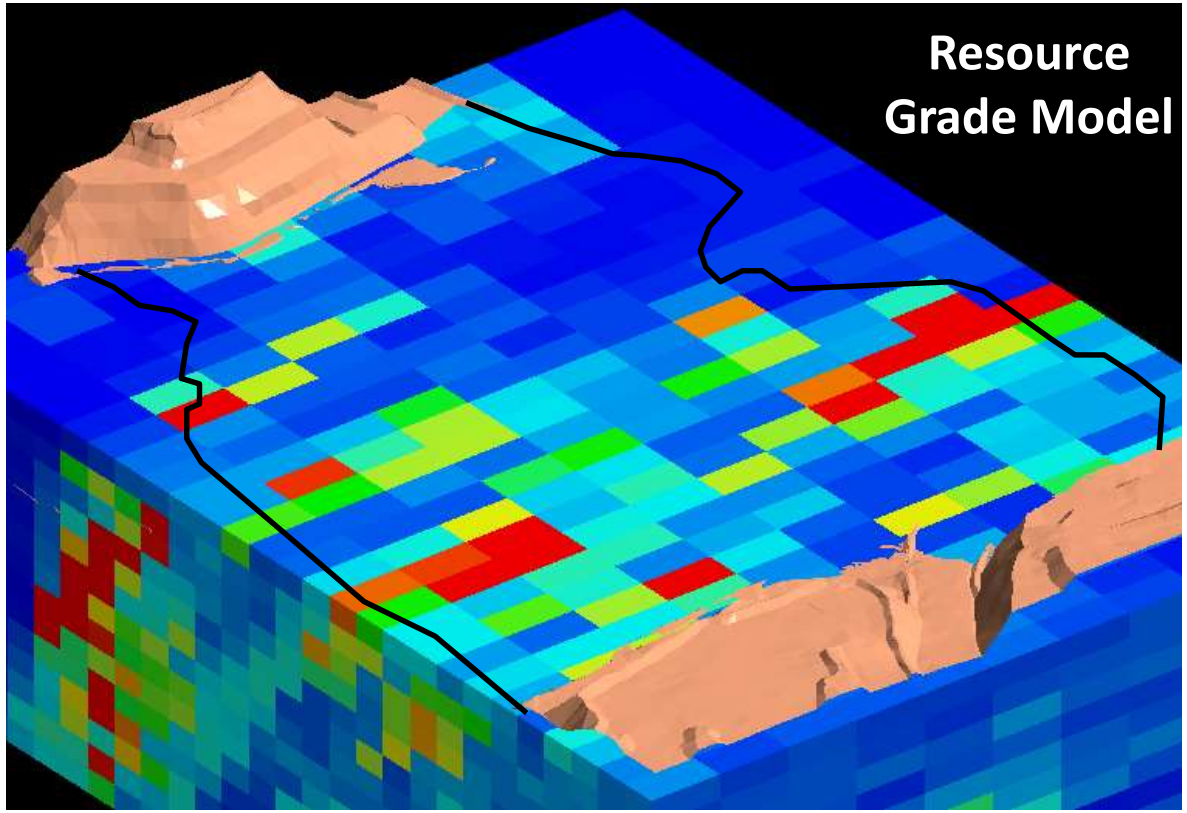
Starting to match energy to rock hardness

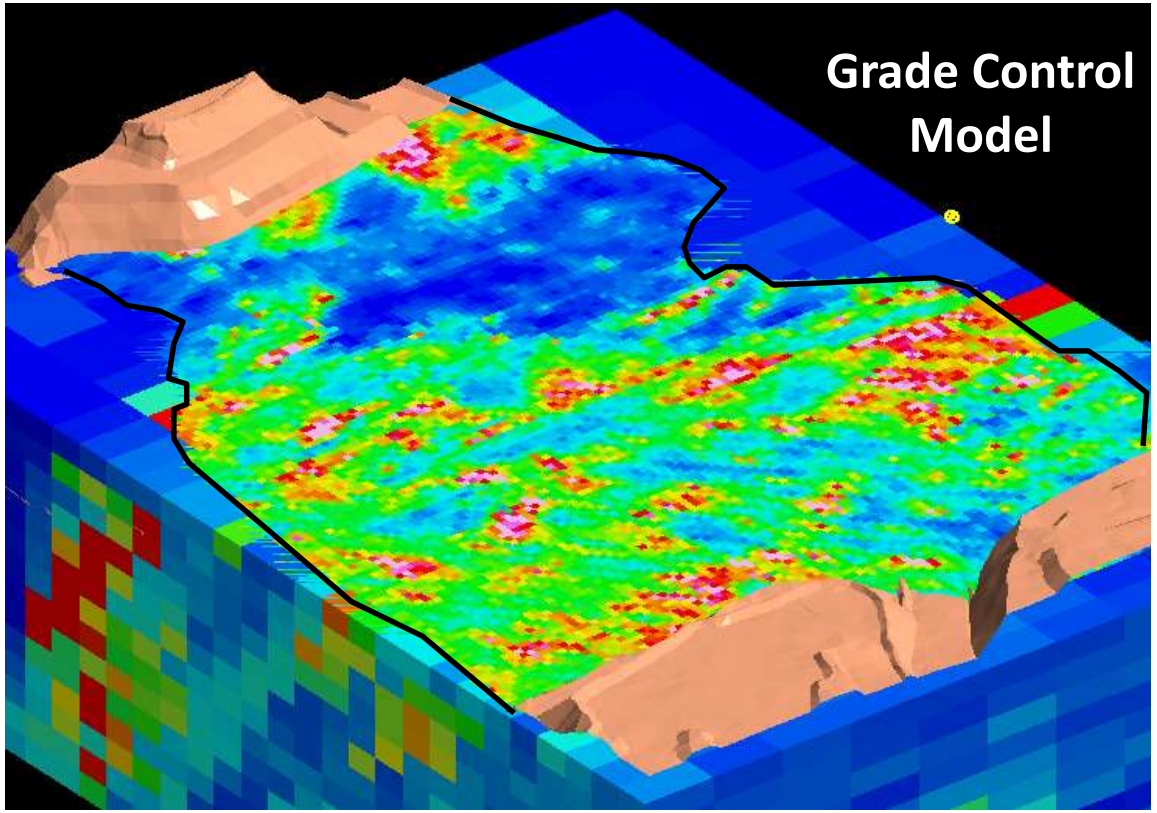
IMDEX™
REAL-TIME SUBSURFACE SOLUTIONS

Starting to match energy to rock hardness

IMDEX™
REAL-TIME SUBSURFACE SOLUTIONS

The ideal next steps – improving resolution

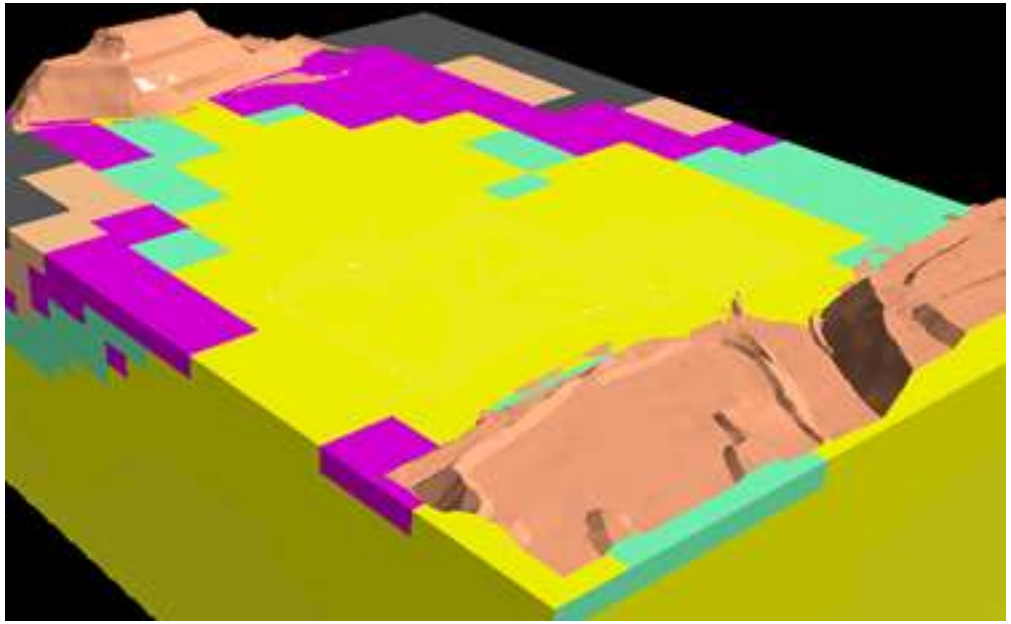


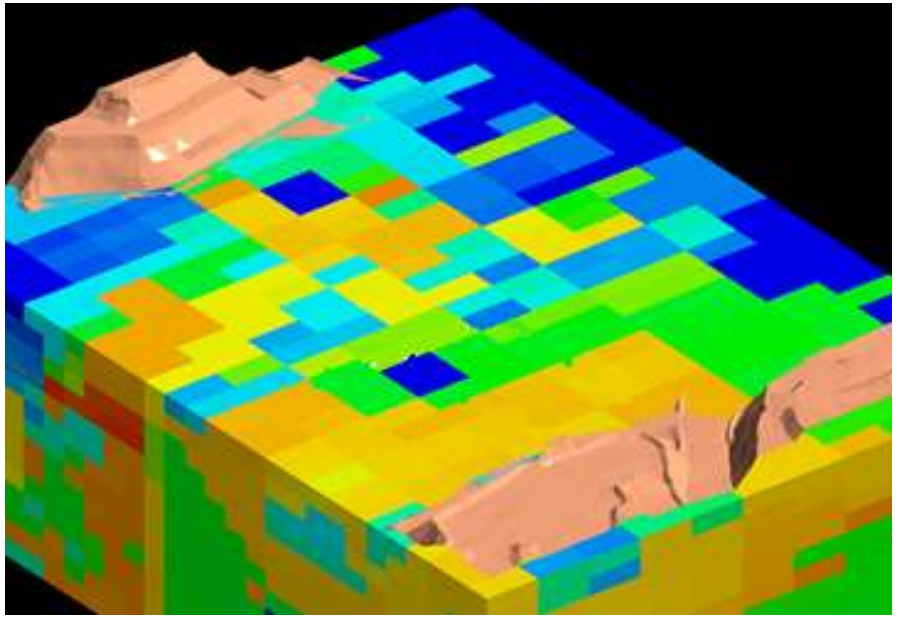


The ideal next steps – improving resolution

IMDEX™
REAL-TIME SUBSURFACE SOLUTIONS

Blastability





Standard Practice

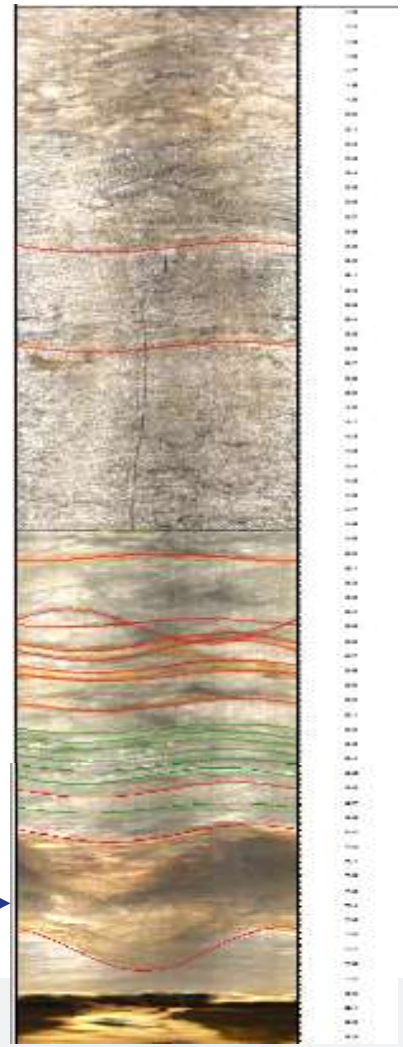
Leading Practice

Grade Control Equivalent

The ideal next steps – accounting for structure

Significant Structures

Open structure/void



10m

So this is what we're doing…

Improving hole & cone quality through additives to drilling fluid

So this is what we're doing…

IMDEX™
REAL-TIME SUBSURFACE SOLUTIONS